

TITLE OF THE INVENTION

DISPLAY DEVICE AND METHOD OF CHECKING INPUT SIGNALS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the priority of Korean Patent Application No. 2002-57321, filed on September 19, 2002, in the Korean Intellectual Property Office, the disclosure of which is incorporated herein in its entirety by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] The present invention relates to a display device, and more particularly, to a display device and a method of checking signals input to the display device according to a set checking order.

2. Description of the Related Art

[0003] If a currently displayed signal is abnormal, conventional display devices enter a saving mode or display a warning message to a user. In this situation, if the user desires to check another input signal, signal changing has to be performed using a signal changing key of a display device. If necessary, signals are changed several times through an input key. Thus, it takes a large amount of time to change the signals, and the user has to manipulate the signal changing key when changing the signals.

SUMMARY OF THE INVENTION

[0004] Accordingly, the present invention provides a display device which, if input signals are abnormal, automatically changes the input signals according to a signal checking order, the number of times the input signals are checked, or the time required to check the input signals set by a user. The present invention further provides a method of checking signals input to the display device.

[0005] According to an aspect of the present invention, there is provided a display device including a signal identifying unit, a signal checking unit, and a signal changing unit. The signal identifying unit receives an input signal and identifies the type of input signal that is received.

The signal checking unit checks whether the identified input signal is abnormal. The signal changing unit switches from the checked input signal to a next input signal so that the signal checking unit can check whether the next input signal is abnormal, after the signal checking unit checks whether the identified input signal is abnormal.

[0006] According to another aspect of the present invention, there is also provided a method of checking a signal input into a display device. The input signal is received and the type of input signal that is received is identified. Whether the identified input signal is abnormal is checked. The checked input signal is switched to a next input signal to check whether the next input signal is abnormal, after whether the identified input signal is abnormal is checked.

[0007] Additional and/or other aspects and advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] These and/or other aspects and advantages of the invention will become apparent and more readily appreciated from the following description of the preferred embodiments taken in conjunction with the accompanying drawings in which:

FIG. 1 is a block diagram of a display device according to an embodiment of the present invention;

FIG. 2 is a flowchart for explaining a method of checking a signal input to a display device according to an embodiment of the present invention;

FIG. 3 is a view illustrating when a signal input to a display device is normal, the number of times the signal is checked is set according to an embodiment of the present invention;

FIG. 4 is a view illustrating when a signal input to a display device is abnormal, the time required to check the signal is set according to an embodiment of the present invention;

FIG. 5 is a view illustrating a menu showing which signal input to a display device is checked and which one of the signals is first checked according to an embodiment of the present invention;

FIG. 6 is a flowchart for explaining a method of changing a signal input to a display device according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0009] Reference will now be made in detail to the present preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. The embodiments are described below in order to explain the present invention by referring to the figures.

[0010] FIG. 1 is a block diagram of a display device according to an embodiment of the present invention. Referring to FIG. 1, an input unit 111 receives signals from a computer 101, a digital versatile data (DVD) player 103, a television (TV) set (not shown), a VCR (not shown), or the like. The input unit 111 may include a plurality of ports, which are used only to receive a PC analog signal, a PC digital signal, a TV signal, a VIDEO signal, an S-VIDEO signal, and a digital TV (DTV) signal. The input unit 111 may also include a port used only to receive digital signals and a port used only to receive analog signals.

[0011] A user designates and inputs data on the number of times signals are checked, the time required to check the signals, and the order of checking the signals, by watching a screen of a display unit 117 displayed according to an on-screen display method. Then, a data setting unit 112 receives and sets the data. A signal identifying unit 113 identifies ports of input signals to identify the types of the input signals, e.g., a D-sub analog signal, a DVI analog signal, a DVI digital signal, or a VIDEO signal. In other words, since a display device 100 includes a port to input analog signals and a port to input digital signals, the signal identifying unit 113 identifies the ports to identify the types of signals. A signal changing unit 114 moves from a checked signal to a next signal to be checked. Then a signal checking unit 115 checks whether a signal is found to be abnormal. Thus, signals set as objects to be checked to determine if they are abnormal are checked according to the checking order set by the data setting unit 112.

[0012] After the signal identifying unit 113 has identified the types of signals, a signal checking unit 115 can check whether the signals are abnormal by decoding the signals or by checking whether signal cables are connected to the display device 100. For example, the signal checking unit 115 can check whether H and V signals are abnormal according to a sync processor's determination and check whether a VIDEO signal or a TV signal output from a decoder decoding a VIDEO or TV signal is abnormal. If a checked signal is abnormal, a signal controlling unit 116 checks the number of times the signals were checked, the time required to check the signals, or the order of checking the signals. The signal controlling unit 116 then selects one of the signals to be checked following the checked signal, and sets conditions of the

selected signal containing data on an input port corresponding thereto. The display unit 117 displays input signals and data set by the data setting unit 112.

[0013] FIG. 2 is a flowchart for explaining a method of checking signals input to a display device according to an embodiment of the present invention.

[0014] The display device 100 receives and displays various types of signals, e.g., a PC analog signal, a PC digital signal, a TV signal, a VIDEO signal, an S-VIDEO signal, a DTV signal, and the like, to a user. In operation 210, the user designates data on the number of times signals input from the computer 101, the DVD player 103, a TV, or a VCR are checked, the time required to check the signals, the order of checking the signals, seeing a screen of the display unit 117 displayed according to an on-screen display method and inputs data to the display unit 117, and then the data setting unit 112 sets data on checked input signals.

[0015] If signals are input from the computer 101, the DVD player 103, the TV, or the VCR, in operation 220, the signal identifying unit 113 identifies input ports to identify the types of signals to be checked. If the types of signals to be checked have been identified, the signal checking unit 115 checks whether the signals are abnormal by decoding the signals or by checking whether signal cables are connected to the display device 100. In other words, in operation 231, the signal checking unit 115 checks whether H-sync and V-sync patterns of a D-sub analog signal are abnormal, e.g., whether one of the H-sync and V-sync patterns are not input or one of the input H-sync and V-sync patterns is abnormal, and whether a D-sub cable is connected to check whether the D-sub signal is abnormal. In operation 233, the signal checking unit 115 checks whether H-sync and V-sync patterns of a digital visual interface (DVI) digital signal are abnormal and whether a DVI cable is connected to check whether the DVI digital signal is abnormal. In operation 235, the signal checking unit 115 checks whether H-sync and V-sync patterns of a VIDEO signal are abnormal and whether a VIDEO cable is connected to check whether the VIDEO signal is abnormal. In operation 237, the signal checking unit 115 checks whether H-sync and V-sync patterns of a TV signal are abnormal and whether an antenna cable is connected to check whether the TV signal is abnormal.

[0016] The signal changing unit 114 checks the number of times the D-sub analog signal, the DVI digital signal, the VIDEO signal, and the TV signal are checked, the time required to check the D-sub analog signal, the DVI digital signal, the VIDEO signal, and the TV signal, and the

order of checking the D-sub analog signal, the DVI digital signal, the VIDEO signal and the TV signal. Also, this signal changing unit 114 moves from a signal that has been checked from along the D-sub analog signal, the DVI digital signal, the VIDEO signal, and the TV signal to a new signal from among the same signals to be checked by the signal check unit 115..

[0017] In operation 240, the signal checking unit 115 checks whether the signal is abnormal. If the signal is normal, in operation 251, the signal is set to be in a normal signal state. If the signal is abnormal, in operation 253, the signal is set to be in an abnormal signal state. When an input signal is set to be in a normal state, the input signal continues being displayed. When the input signal is set to be in an abnormal state, the input signal stops being displayed.

[0018] FIG. 3 illustrates that when signals input to the display device 100 are normal, a user sets the number of times the signals are checked by watching a screen of the display unit 117 displayed according to an on-screen display method, where the number of times the signals are checked is set to be two, according to an embodiment of the present invention. Of course, one will recognize that the signal may be checked more or less than twice according to the present invention.

[0019] FIG. 4 illustrates that when signals input to a display device are abnormal, a user sets the time required to check the signals by watching a screen of the display unit 117 displayed according to an on-screen display method, where the time required to check the signals is set to be 10 seconds, according to an embodiment of the present invention.

[0020] FIG. 5 illustrates a menu from which a user can determine which signal input to the display device 100 is checked and which signal is first checked according to an embodiment of the present invention. Here, checking is performed in order of a D-sub analog signal, a DVI analog signal, a DVI digital signal, and a VIDEO 1 signal, and a TV signal and a VIDEO 2 signal are set not to be checked.

[0021] FIG. 6 is a flowchart for explaining a method of changing signal checking from a currently displayed signal to a next signal according to the order of checking signals input to the display device 100, according to an embodiment of the present invention.

[0022] If a currently displayed signal enters an abnormal mode, in operation 610, the signal controlling unit 116 determines whether the number of times the currently displayed signal is

checked exceeds the number of times set by a user and whether the signal checking time set by the user has elapsed. If in operation 610, the signal controlling unit 116 determines that the number of times the currently displayed signal is checked does not exceed the number of times set by the user or the signal checking time has not elapsed, in operation 620, the signal checking unit 115 continues checking the currently displayed signal according to the number of times and the checking times that are set by the user. If in operation 610, the signal controlling unit 116 determines that the number of times the currently displayed signal is checked exceeds the number of times set by the user and the signal checking time has elapsed, in operation 630, the signal controlling unit 116 determines a next signal to be checked according to the signal checking order and in operation 640, sets conditions of the determined signal containing data on an input port corresponding thereto. The signal changing unit 114, in operation 650, then initiates checking whether the next signal, determined by the signal controlling unit 116, is abnormal. The signal checking unit 115 checks whether the determined signal is abnormal and in operation 660, the signal checking unit 115 determines whether the determined signal is normal. If in operation 660, it is determined that the checked signal is normal, in operation 670, the normal signal is displayed on the display unit 117. If in operation 660, the checked signal is not normal, the process goes to operation 610 which is repeated for all of the signals set by the data setting unit 112.

[0023] As is described above, according to an embodiment of the present invention, if a signal displayed on a display device 100 is abnormal, a checking process moves to a next signal to check the next signal, so that input signals are checked according to the checking order, the checking time, or the checking number of times preset by a user. Thus, a user can change a currently displayed signal to another signal without changing signals using a signal changing key and without manipulating an additional key. Of course, in an alternate embodiment of the present invention, the currently displayed signal may be changed to another signal automatically. As a result, signals can be quickly changed and the user can conveniently change signals.

[0024] While the present invention has been particularly shown and described with reference to an exemplary embodiment thereof, it will be understood by those of ordinary skill in the art that various changes in form and details may be made therein without departing from the spirit and scope of the present invention as defined by the following claims.